Current and Coming in Endourology

Highlights of the 18th World Congress on Endourology and SWL and the 16th Basic Research Symposium
September 14-17, 2000, São Paulo, Brazil

[*Rev Urol.* 2001;3(1):6-9]

Key words: Benign prostatic hyperplasia • Carcinoma, renal • Laparoscopy • Shock wave lithotripsy • Ureteropelvic junction obstruction • Ureteroscopy • Urolithiasis

Participants at the World Congress and the Basic Research Symposium, set in the capital city of São Paulo, presented their clinical and basic science research findings to enthusiastic audiences of investigators and clinicians. The result was a stimulating international exchange of ideas.

Basic Research Symposium

Minimally invasive ablation of renal tumors has been evaluated in animal models and in humans using various energy sources, particularly radiofrequency (RF) and cryotherapy, but RF and cryotherapy have not been studied using a renal carcinoma animal model. Investigators from Madison, Wis, reported on their study in which the left kidney in each of 68 rabbits was implanted with VX2 renal carcinoma cells.[1] One week later, tumors were removed by either RF ablation (Rita Medical Systems) or cryoablation using the Cryocare system (Endocare Inc). The 2 other arms of the study consisted of rabbits treated with open radical nephrectomy and nontreated control rabbits. These animals were sacrificed at 22 days after treatment. The control animals developed significant local and metastatic disease, demonstrating the viability of this tumor model. There was no significant difference in the development of local disease, metastatic disease, or cure rate in animals treated with RF ablation, cryoablation, or nephrectomy. The development of this renal carcinoma animal model should lay the foundation for future studies that may delineate subtle differences between these currently accepted energies and allow the evaluation of newer energy sources for tumor ablation.

Although there were a number of shock wave lithotripsy (SWL) studies reported, one of the more important studies was presented at the 16th Basic Research Symposium. Researchers from Indianapolis discussed the effects of shock wave delivery rate on stone fragmentation.[2] Since the arrival of nonsynchronized SWL, urologists have been able to adjust the shock wave delivery rate. In an effort to determine the most effective delivery rate, these researchers performed an in vitro study looking at various rates and their effect on fragmentation efficacy. Model stones were exposed to 400 shock waves at 20 kV, with rates varying from 12 to 120 shock waves per minute. Investigators studied the number and size of stone fragments as well as high-speed video and diagnostic ultrasonography to record bubble activity. Their data revealed that stones exposed to slower rates (from 12 to 30 shock waves per minute) exhibited significantly greater fragmentation than did stones exposed to faster rates. In fact, when slower rates were used, fewer shock waves were required to achieve complete fragmentation. Based on the high-speed video studies, it was found that when a higher rate is used, the bubble cloud that develops near the stone during SWL does not have time to dissipate before the next shock wave arrives. Although the findings of this investigation have yet to be studied in a clinical setting, slowing the shock wave delivery rate may improve our overall success with SWL.

Another interesting set of studies examined the role of biofilm formation on ureteral stents and the influence it has on the development of urinary tract infections. One study from Oregon Health Sciences University in Portland described significant differences in the amount of *Escherichia coli* attached to various stent materials.[3] The different stents were placed within a perfusion chamber and were then washed with urine, which had been inoculated with *E coli*. Techoflex (Circon/ACMI) seemed to have significantly less bacterial adherence than did the other stent materials tested. A London, Ontario, urology group evaluated the use of oral fluoroquinolones in the prevention of biofilm formation.[4] These researchers found that ciprofloxacin levels in the biofilm

Reviewed by Michael Conlin, MD, Oregon Health Sciences University, Portland.

were higher than ofloxacin levels and that 3 days of ciprofloxacin use were enough to inhibit bacterial adherence to the biofilm for up to 1 week. It may be that the simplest solution to biofilm formation and bacterial adherence to ureteral stents is a short course of ciprofloxacin.

Management of Renal Cell Carcinoma

Laparoscopic radical nephrectomy has become a well-accepted technique for the management of renal cell carcinoma (RCC). Experience with this technique has matured throughout the world, and the leading centers reported their most recent results. The Johns Hopkins University experience is one of the largest; physicians performed 67 laparoscopic radical nephrectomies between 1991 and 1998 for clinically localized T1-2 N0 M0 RCC.[5] The investigators compared this with results from 54 patients who underwent open radical nephrectomy for similarly staged disease. With a mean follow-up of 28 months (laparoscopic group), there was no significant difference between the laparoscopic and open nephrectomy groups with regard to Kaplan-Meyer disease-free survival and actuarial survival analysis. There were, however, obvious advantages in the laparoscopic group with regard to postoperative convalescence.

More centers around the country are evaluating laparoscopic partial nephrectomy. A group from Ann Arbor, Mich, compared their selective use of hand-assisted laparoscopic partial nephrectomy with an open surgical approach for suspected malignancy.[6] Nine patients with 11 tumors were treated in the laparoscopic group, compared with 11 patients who received open partial nephrectomies. The mean operative time was 24% longer in the laparoscopic group, but the recovery was much more favorable for that group, with significantly less parenteral narcotic use, shorter hospital stays, and more rapid return to work, when measured at 2 and 6 weeks postoperatively.

There were several reports examining the use of an electrosurgical snare (Washington University),[7] a cable-tie device (Southwestern University, Dallas),[8] and Endoloop (Indianapolis)[9] to assist with laparoscopic partial nephrectomy in animal models. Each of these newer devices seemed to allow a safer and more effective laparoscopic partial nephrectomy. Further work by these groups should allow the development of such devices for clinical use.

Management of Benign Prostatic Hyperplasia

The ideal procedure for management of bladder outlet obstruction caused by benign prostatic hyperplasia (BPH) would be performed on an outpatient basis, with a low risk of complications and a success rate similar to that for transurethral resection of the prostate (TURP). While the ideal procedure has not been developed, advances in the minimally invasive management of BPH continue to be pursued by industry and urologists. Experience with transurethral microwave thermotherapy (TUMT) continues to grow; one of the largest studies reported at this year's World Congress came from the TUMT Study Group.[10] Between August 1997 and June 2000, 294 men who took part in this trial were treated without intravenous sedation. The patients were given only ibuprofen, lorazepam, and ketorolac (intramuscularly). Some patients received low-energy treatment (2.0 software), and others received the newer high-energy treatment (2.5 software), with the Prostatron TUMT device. Mean peak flow rates improved 32% in both treatment groups, and International Prostate Symptom Scores (IPSS) decreased accordingly. The patients, almost universally, tolerated the procedure well with the oral and intramuscular premedication alone.

A newer modality for the minimally invasive treatment of BPH is water-induced thermotherapy (WIT), and several centers reported their investigations. Urologists in Germany, Israel, Denmark, and the United Kingdom[11] conducted a multicenter clinical study. They reported 2-year follow-up data from 125 patients treated with WIT. WIT incorporates the Thermoflex device (Argomed) that circulates water heated to 60°C (140°F) so as to cause coagulation necrosis of the obstructing prostatic tissue. The procedure requires only local anesthesia. Significant improvements in peak flow rate (baseline, 8.7 mL/s; 12 months, 15.7 mL/s) and in IPSS (baseline, 23.5; 12 months, 11.7) were noted at 12-month follow-up and remained durable at 2-year follow-up. There is growing interest in the use of WIT for the management of BPH, and these results seem to validate the early optimism.

For urologists who prefer endoscopic treatment of patients with BPH, a new device (Gyrus) has been developed, using bipolar electrocautery, for TURP and vaporization of prostatic tissue. The device can be used with either a loop or a vaporization electrode. Because of the bipolar nature of the device, saline irrigation is possible. During electrovaporization, desiccation of underlying tissue does not seem to occur; this has been a problem with standard transurethral vaporization techniques. A report from France reviewed the results of 42 patients treated between October 1998 and February 1999 using the new device for electrovaporization.[12] All patients were followed for 12 months postoperatively. There were no major complications; in particular, no recatheterization was necessary for postoperative bleeding. At 1 year, mean peak flow rate improved from 7.9 to 19 mL/s, and IPSS score decreased from 16 to 7. This device may gain in popularity, if for no other reason than that a resection of the prostate can be performed with saline, eliminating the possibility of the transurethral resection syndrome.

continued

Management of UPJ Obstruction

Controversies continue in the management of ureteropelvic junction (UPJ) obstruction. Controversies include the importance of the crossing vessel, use of the Acucise device, antegrade versus retrograde approach, and the best energy source to perform endopyelotomy.

Investigators from Loyola University in Chicago discussed 122 endopyelotomies, performed during 9 years, using the Acucise device under fluoroscopic control to make a pure lateral incision of the UPJ.[13] Success was defined as improvement with no evidence of obstruction on the follow-up radiologic evaluation. With a mean follow-up of 26 months, the overall success rate was 80.3%. Ureteral bleeding occurred in 4 patients (3.3%). The investigators suggested that a 3-dimensional CT scan be performed when there is a high suspicion of vessel anomalies.

The group from Oregon Health Sciences University in Portland reported the use of a selective management model in patients with UPJ obstruction.[14] Thirty-five patients were evaluated for UPJ obstruction. Endoluminal ultrasonography, performed immediately before endopyelotomy, demonstrated crossing vessels in 19 patients (54%). Nine (47%) of the 19 patients had large crossing vessels identified on endoluminal ultrasonography and no endoscopic evidence of luminal obstruction. In these patients, endopyelotomy was not performed. Two of these patients had complete resolution of symptoms; 6 underwent open pyeloplasty, and 1 underwent laparoscopic pyeloplasty, all successfully. Endopyelotomy was successful in 85% of patients overall, but the success rate was higher for patients without crossing vessels (94%) than for those with crossing vessels (70%). Factoring in the patients who underwent open pyeloplasty, the overall success rate for all patients was 89%. This study seems to demonstrate the importance of the crossing vessel and the effect that large crossing vessels have on endopyelotomy success rates. By identifying those patients with a UPJ obstruction caused primarily by the crossing vessel and treating them with pyeloplasty, the overall success rate seems to have been improved.

Main Points

- Slowing the rate of shock wave delivery improves stone fragmentation in vitro.
- A 3-day course of a fluoroquinolone can prevent biofilm formation and bacterial adherence to ureteral stents.
- Laparoscopic radical nephrectomy for T1-2 N0 M0 renal cell carcinoma appears to offer equivalent cancer control but better postoperative convalescence, compared with open radical nephrectomy.
- Continued improvements are being made in the technique of laparoscopic partial nephrectomy.
- Early results with water-induced thermotherapy for treatment of patients with benign prostatic hyperplasia are encouraging.
- Endopyelotomy for ureteropelvic junction obstruction (UPJ) is less successful when a crossing vessel is present.
- Results with laparoscopic pyeloplasty for the treatment of patients with UPJ are very good.

Investigators from Montreal reviewed their experience using the holmium laser to perform retrograde endopyelotomy, a procedure in which the incision can also be made using electrocautery or a cold knife.[15] Other studies of the holmium laser seem to indicate that it is at least as good as the other choices of incision technique. In this study of 13 patients with UPJ obstruction, the Montreal group used a ureteroscopic approach, making a posterolateral incision with the holmium laser. The overall success rate was 38% after 1 treatment and 46% after 2 treatments. It was thought that this low success rate was caused by poor patient selection. I am concerned that the holmium laser may be creating more tissue damage adjacent to the incision. For this reason, I primarily use electrocautery to perform ureteroscopic endopyelotomy.

A growing experience with laparoscopic pyeloplasty was reported in a combined study (from Baltimore; Norfolk, Va; and St Louis) of 94 patients treated with laparoscopic pyeloplasty.[16] Average follow-up was 18 months. Most patients had primary UPJ obstruction. The most common technique used to repair the UPJ was dismembered pyeloplasty; Y-V plasty or Heineke-Mickulicz repair was also performed. Sixteen patients had concomitant stones requiring pyelolithotomy. The investigators detected crossing vessels in 54% of their patients. The overall success rate (by radiologic evaluation) was 95%. A greater than 50% reduction in pain was reported by 94% of patients. This large study with adequate follow-up demonstrates excellent, durable results with this technique, which also seems to be a viable option in patients with concomitant renal calculi.

Ureteroscopy

With improvements in ureteroscopes and working instruments, ureteroscopy has been applied to a wider variety of upper urinary tract disorders. Researchers from Durham, NC, reviewed their experiences with ureteroscopy over three 2-year periods: 1991 to 1993, 1994 to 1996, and 1997 to 1999.[17] Not only did the overall number of patients treated increase significantly (from 122 in the first period to 419 in the last), but the distribution of renal calculi increased significantly, from 3% to 24%, respectively.

Improvements in ureteroscopes and working instruments should continue to expand the variety of upper urinary tract disorders that we can manage successfully.

Difficulties in the management of ureteral calculi during pregnancy have encouraged many endourologists to treat these patients more aggressively in order to avoid long-term stenting. Because of the hypercalciuria of pregnancy, ureteral stents can become calcified quickly. Having to change these stents frequently makes ureteral stenting during pregnancy a less attractive option. If a stone can be identified, most endourologists manage the stones endoscopically.

A group from Indianapolis used ureteroscopy in pregnant patients as a first-line intervention for ureteral calculi.[18] Ten consecutive pregnant patients with renal colic requiring intervention were reviewed; most were in the second trimester of pregnancy. In all patients, ultrasonography demonstrated a low sensitivity of 37% when compared with intraoperative findings. Four of these 10 patients were treated with upper urinary tract drainage (stent or percutaneous nephrostomy tube) alone because of urinary tract infection or late gestation. Ureteroscopy was used as a first-line intervention in the remaining 6 patients; 4 of these patients had stones that were managed successfully, and no stones were found in 2 patients. The mean size of the stones retrieved was 7 mm. There were no obstetric or urologic complications in any of the 10 patients requiring treatment. This presentation supports a more aggressive ureteroscopic approach to the management of ureteral calculi during pregnancy.

One of the largest studies of ureteroscopy for ureteral calculi, reported by urologists from Rome, included 681 patients.[19] Many of these patients, including those with proximal ureteral calculi, had had unsuccessful SWL. The investigators used 10F and 11.5F rigid ureteroscopes and ultrasonic or ballistic lithotripsy. The stone-free rate after a single procedure ranged from 93% in patients treated for Steinstrasse to 96% in patients treated for distal ureteral calculi. With the addition of a second procedure, the stone-free rate approached 100% in all patients. Minor complications, including renal colic, pain, and fever, occurred in approximately 5% of patients. Major complications, including perforation of the ureter, occurred in 4% of patients. This series demonstrates the excellent success rate with ureteroscopy for ureteral calculi. If the newer, smaller ureteroscopes and working instruments had been used, the overall complication rate would likely have been less.

Summary

This meeting review presents just a few of the many advances presented at the 18th World Congress on Endourology and SWL. Progress was reported in laparoscopy, including nephrectomy, donor nephrectomy, pyeloplasty, and radical prostatectomy. Well-established techniques of managing urolithiasis, including ureteroscopy and percutaneous techniques, are being refined. Further investigations of energy sources, such as RF, cryotherapy, and high-intensity focused ultrasound, may lead to viable percutaneous management options for renal tumors. Further advances in minimally invasive endourology are anticipated at the 19th World Congress on Endourology, which will be held November 14 to 17, 2001, in Bangkok, Thailand. ■

References

1. Nakada SY, Jerde TJ, Johnson CD, et al. Efficacy of radiofrequency ablation, cryoablation, and nephrectomy in treating rabbit kidney VX2 carcinoma [abstract]. *J Endourol.* 2000;14(suppl 1):A1. Abstract BS1-2.
2. Lifshitz DA, Williams JC, Lingeman JE, et al. Slowing the shock wave delivery rate improves stone fragmentation: in vitro study using model stones [abstract]. *J Endourol.* 2000;14(suppl 1):A6. Abstract BS2-3.
3. Paduch DA, Heffron F, Conlin MJ. Should we use hydrophilic coated stents in patients with urinary tract infections? A study of bacterial adhesion to different stent materials [abstract]. *J Endourol.* 2000;14(suppl 1):A13. Abstract BS4-3.
4. Reid G, Habash M, Vachon D, et al. Oral fluoroquinolone therapy results in drug adsorption onto ureteral stents and prevention of biofilm formation [abstract]. *J Endourol.* 2000;14(suppl 1): A12. Abstract 4-1.
5. Chan DY, Jarrett TW, Roberts WW, et al. Laparoscopic radical nephrectomy: cancer control and renal cell carcinoma [abstract]. *J Endourol.* 2000; 14(suppl 1):A31. Abstract P4-7.
6. Wolf JS, Seifman BD, Montie JE. Nephron-sparing surgery for suspected malignancy: open surgery compared to laparoscopy with selective use of hand-assistance [abstract]. *J Endourol.* 2000;14(suppl 1):A33. Abstract P4-14.
7. Collyer WC, Landman J, Olweny EO, et al. Laparoscopic partial nephrectomy with a novel electrosurgical snare in a porcine model [abstract]. *J Endourol.* 2000;14(suppl 1):A2. Abstract BS1-6.
8. Corwin TS, Traxer O, Collick C, et al. Cable-tie regional hypoperfusion to facilitate laparoscopic partial nephrectomy [abstract]. *J Endourol.* 2000; 14(suppl 1):A2. Abstract BS1-7.
9. Beck SD, Lifshitz D, Cheng L, et al. Endoloop-assisted laparoscopic partial nephrectomy in a porcine model [abstract]. *J Endourol.* 2000;14 (suppl 1):A2. Abstract BS1-8.
10. Ridas DA, Bagley DH, Gomella LG, et al. Transurethral microwave thermotherapy (TUMT) of the prostate without IV sedation: results of a single US center using both low-energy and high-energy protocols [abstract]. *J Endourol.* 2000;14 (suppl 1):A72. Abstract P14-2.
11. Muschter R, Schorsch I, Matalon G, et al. Two-year follow-up of a multi-center clinical study using water-induced thermotherapy (WIT) for benign prostatic hyperplasia (BPH) [abstract]. *J Endourol.* 2000;14(suppl 1):A74. Abstract P14-11.
12. Botto H, Barre P, Herve J, et al. Electro-vaporization of the prostate with the Gyrus device [abstract]. *J Endourol.* 2000;14(suppl 1):A35. Abstract P5-1.
13. Kim FJ, Valenzuela RG, Rice KR, et al. Acusize endopyelotomy–122 procedures, single institutional experience [abstract]. *J Endourol.* 2000;14(suppl 1):A60. Abstract P11-4.
14. Conlin MJ. Results with selected management of ureteropelvic junction obstruction [abstract]. *J Endourol.* 2000;14(suppl 1):A61. Abstract P11-7.
15. Stephenson AJ, Elhilali MM, Arsenault D. Holmium:YAG retrograde endopyelotomy for ureteropelvic junction obstruction: preliminary experiences [abstract]. *J Endourol.* 2000;14(suppl 1): A63. Abstract P11-14.
16. Jarrett TW, Ramakumar S, Lamont DJ, et al. Laparoscopic pyeloplasty: five-year experience [abstract]. *J Endourol.* 2000;14(suppl 1):A41. Abstract P6-13.
17. Auge D, Munver R, Kourambis J, Preminger G. Impact of technical enhancements on ureteroscopic applications [abstract]. *J Endourol.* 2000; 14(suppl 1):A94. Abstract P19-2.
18. Lifshitz DA, Wright A, Lingeman JE, et al. Ureteroscopy and pregnancy as a first-line intervention for ureteral calculi [abstract]. *J Endourol.* 2000;14 (suppl 1):A95. Abstract P19-8.
19. De Marco F, Grillenzoni L, Fini D, et al. Ureteral stones: a retrospective evaluation on 681 intracorporeal lithotripsy [abstract]. *J Endourol.* 2000; 14(suppl 1):A96. Abstract P19-11.